

WHAT IS CLAIMED IS:

1. A kit comprising a cardiac catheter and a leaflet fastener applicator, said cardiac catheter having suitable dimensions for deployment and insertion into a human heart in the vicinity of the mitral or tricuspid valve, said leaflet fastener applicator having a size allowing insertion through said cardiac catheter and being capable of holding portions of opposing heart valve leaflets.
2. The kit of claim 1 wherein said fastener applicator comprises opposing jaws, one of said jaws having a site for holding a tack and the second of said jaws having a site for holding a cap.
3. The kit of claim 1 wherein said fastener applicator comprises a stapler.
4. The kit of claim 1 wherein said fastener applicator comprises a needle and suture, which passes through a leaflet.
5. The kit of claim 1 wherein said fastener applicator comprises sets of opposing arms where each set has suitable dimensions for holding a heart valve leaflet.
6. The kit of claim 1 wherein said fastener applicator comprises a ring.
7. The kit of claim 1 wherein said fastener applicator comprises a clip button including a first element with spikes and a second element that clips onto said first element.
8. The kit of claim 1 further comprising a gripper, said gripper including a tube having a proximal end and a distal end, opposing gripper arms at said distal end of said tube, and an actuator at said proximal end of said tube such that motion of said

actuator changes the relative position of said gripper arms.

9. The kit of claim 1 further comprising a gripper, said gripper having a suitable opening for the application of suction to a heart valve.

10. The kit of claim 1 further comprising instructions describing use of said cardiac catheter and said leaflet fastener applicator.

11. A method of repairing a valve of a beating heart, said method comprising:

a) inserting the distal end of a catheter into the heart to provide access to said valve; and

b) fastening together portions of leaflets of said valve using a leaflet fastener applicator inserted through said catheter.

12. The method of claim 11 wherein the catheter is inserted through an opening in the wall of said beating heart.

13. The method of claim 11 wherein the catheter is introduced into the heart by way of a blood vessel.

14. The method of claim 11 wherein said fastening of said opposing leaflets comprises placement of a sharp projection through said leaflets.

15. The method of claim 11 wherein said fastening of said leaflets comprises suturing together said opposing leaflets.

16. The method of claim 11 further comprising gripping said leaflets with a gripper prior to fastening said leaflets.

17. The method of claim 16 wherein said gripper comprise a tube having a proximal end and a distal end, opposing gripper arms at said distal end of said tube, and an actuator at said proximal end of said tube such

that motion of said actuator change the relative position of said gripper arms.

18. The method of claim 16 wherein said gripper has a suitable opening for the application of suction to a heart valve.

19. The method of claim 11 further comprising inserting a wire through said wall of said heart to initiate an opening through which said cardiac catheter is inserted.

20. The method of claim 11 further comprising making an incision in the wall of the heart for said insertion of said catheter.

21. A device comprising a catheter and a leaflet fastener applicator, said catheter having a proximal end, a distal end and suitable dimensions for insertion into a heart, said leaflet fastener applicator passing through said catheter such that an actuating element projects from said proximal end of said catheter while a fastening element projects from said distal end of said catheter.

22. The device of claim 21 wherein said actuating element comprises a length of suture extending to said distal end of said leaflet fastener applicator.

23. The device of claim 21 wherein said actuating element comprises a lever that controls the delivery of a fastener.

24. The device of claim 21 further comprising a gripper inserted through said cardiac catheter such that gripping appendages project from said distal end and an actuating element projects from said proximal end, where said actuating element controls said gripping appendages.

25. A heart valve leaflet fastener comprising two pairs of arms, each pair having a suitable size for

fastening heart valve leaflets and said two pairs of arms capable of fastening two adjacent leaflets.

26. The heart valve leaflet fastener of claim 26 wherein said arms flex relative to a central core, and wherein said fastener has a locked position where each said pair of arms meet under tension.

27. The heart valve leaflet fastener of claim 26 wherein one of said arms of each pair includes a projection for piercing a leaflet.

28. A heart valve gripper/fastener applicator comprising a gripper and a fastener applicator wherein said gripper and said fastener applicator extend from a single shaft.

29. The gripper/fastener of claim 28 wherein said gripper comprises two opposing jaws.

30. The gripper/fastener of claim 28 wherein said fastener comprises two opposing jaws, one of said jaws having a site for holding a tack and the second of said jaws having a site for holding a cap.

31. A heart valve leaflet fastener applicator comprising two opposing jaws, one of said jaws having a site for holding a tack and the second of said jaws having a site for holding a cap.

32. The heart valve leaflet fastener applicator of claim 31 wherein said jaw having a site for holding a tack further comprises a slot wherein a tack can be shifted to a position opposite said site for holding a cap.

33. A gripper comprising a plunger that slides over an inner shaft and arms having suitable dimensions for gripping heart valve leaflets, said plunger slides such that interaction of heart valve leaflets with said plunger directs said leaflets toward said arms.

34. The gripper of claim 33 wherein said plunger is a balloon plunger that can be inflated and deflated.

35. A fastener applicator comprising a first shaft, a first portion of a button clip having a sharp projection for piercing a heart valve leaflet, a second shaft that slides over said first shaft, and a second portion of said button clip having an opening to engage the projection of said first portion of said button clip, said second portion of said button clip sliding over said first shaft and not over said second shaft such that second shaft can direct said second portion toward said first portion.